Incoming Ray a

Scattered Ray a'

b'   b

$\vec{F}$ Gradient

$\vec{F}_b$ $\vec{F}_a$

$\vec{F}_{b'}$ $\vec{F}_{a'}$

$\vec{F}$ Scattering

b   a

● = Center of Sphere
● = Source Focus
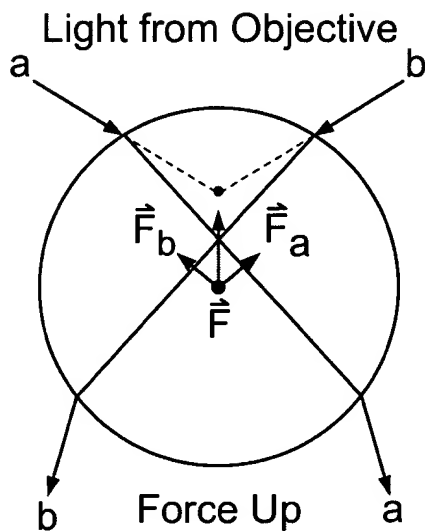
FIG. 1
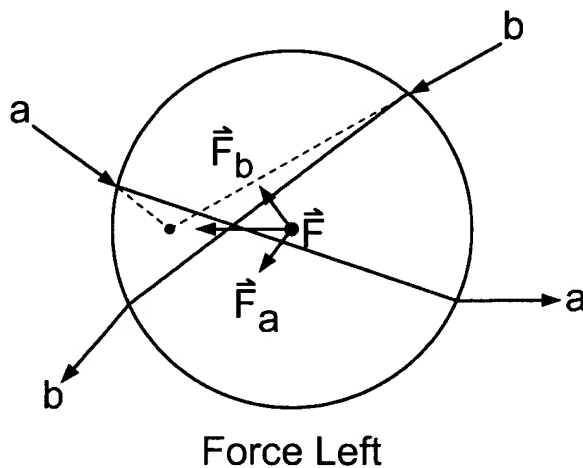**(Prior Art)**

Light from Objective

Force Up

• = Center of Sphere
• = Source Focus
$\vec{F}$ = Gradient Force

FIG. 2A
(Prior Art)
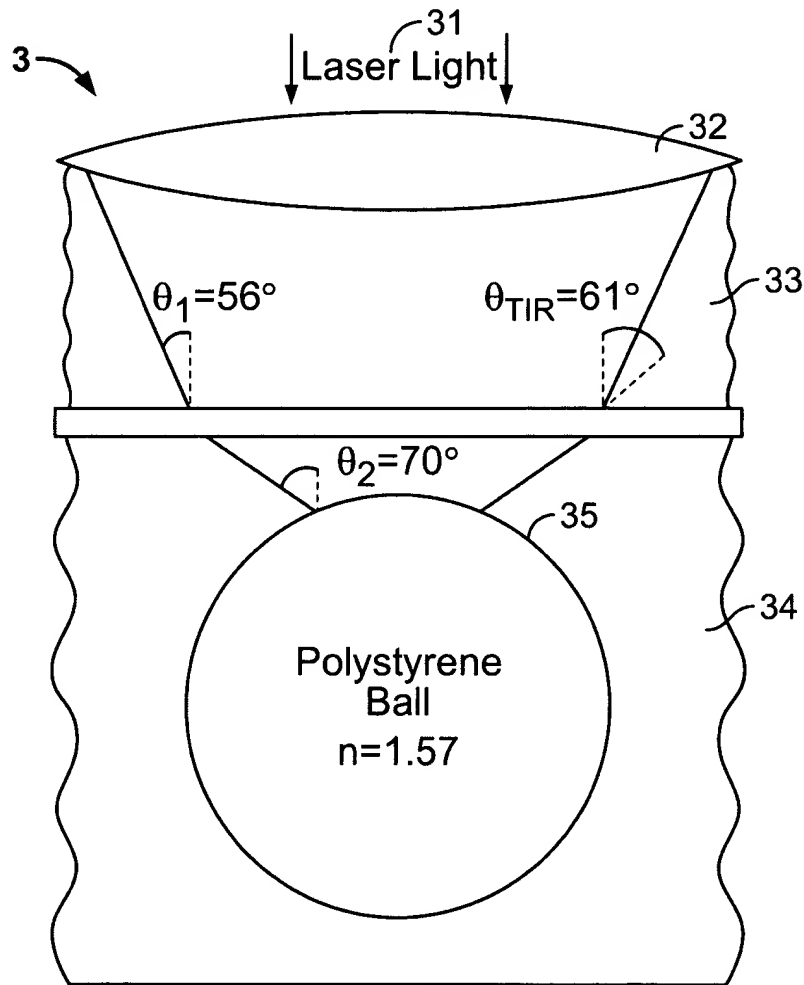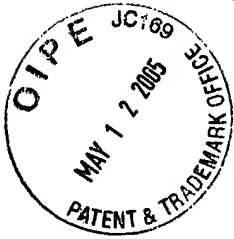

Force Down

• = Center of Sphere
• = Source Focus
$\vec{F}$ = Gradient Force
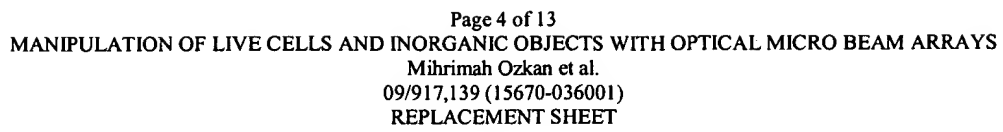
FIG. 2B
(Prior Art)

Force Left

• = Center of Sphere
• = Source Focus
$\vec{F}$ = Gradient Force

FIG. 2C
(Prior Art)

n = Index of Refraction
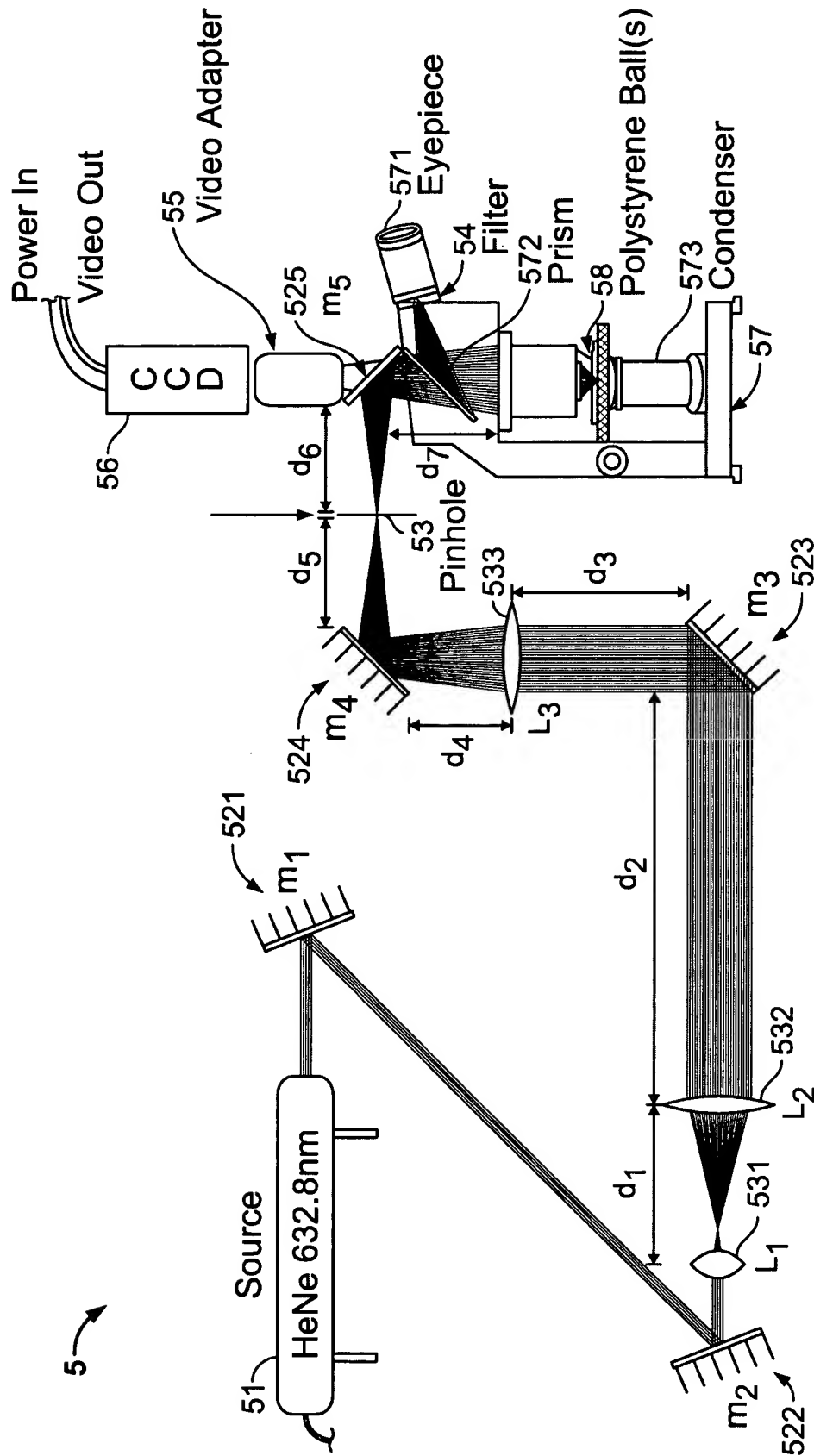N.A. = Numerical Aperture
TIR = Total Internal Reflection

FIG. 3
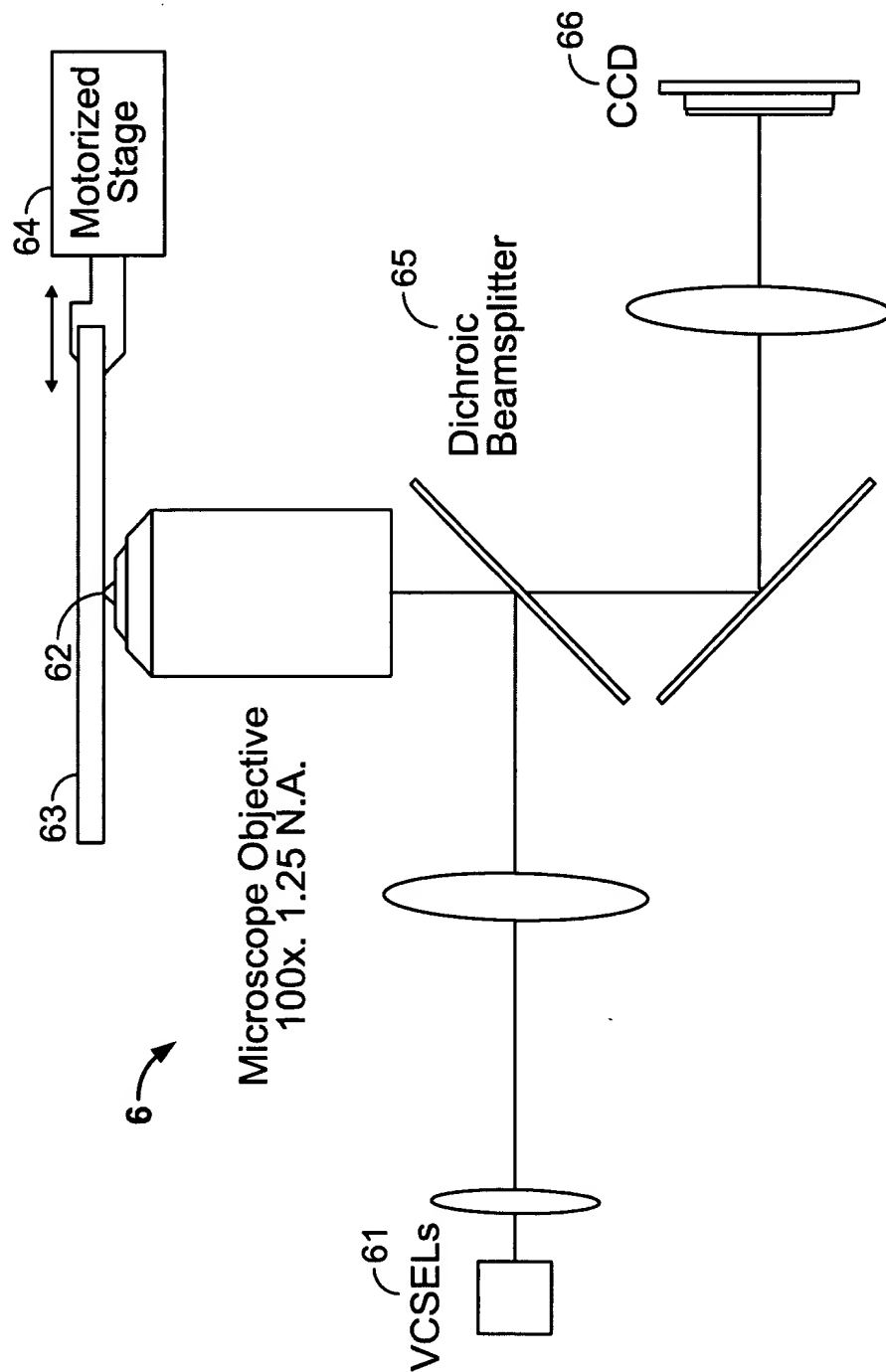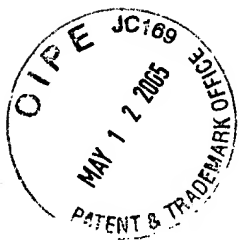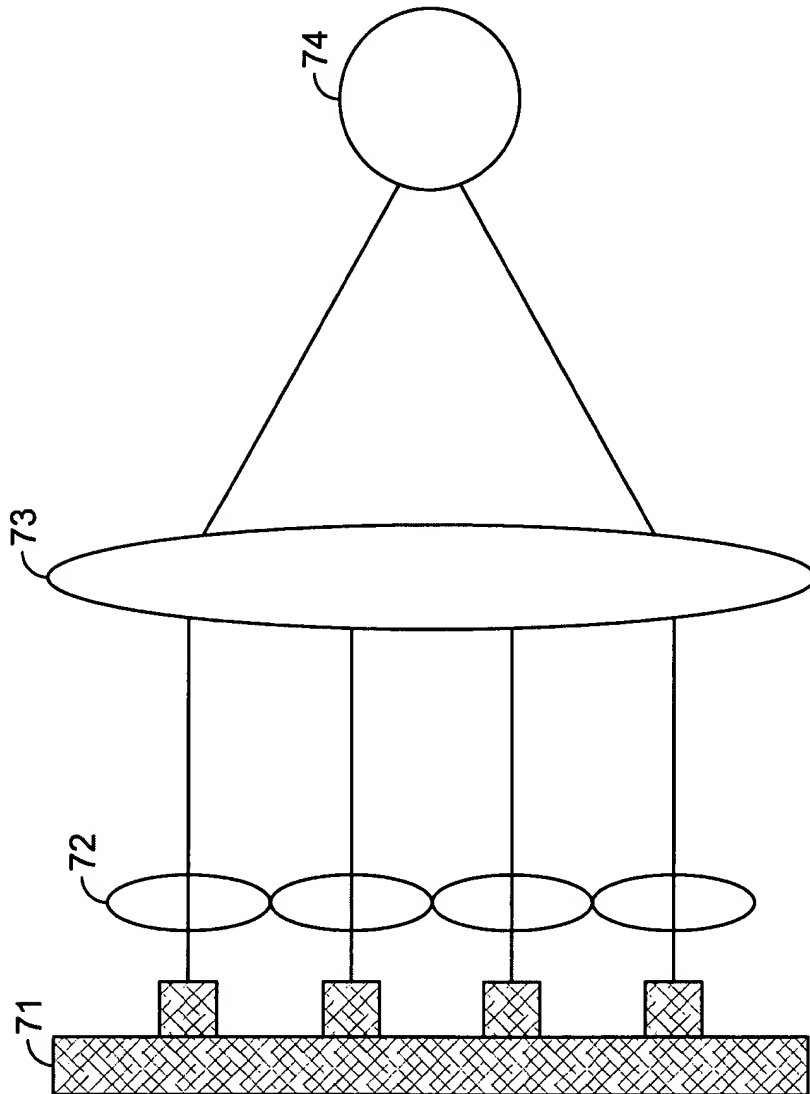**(Prior Art)**

FIG. 4
(Prior Art)
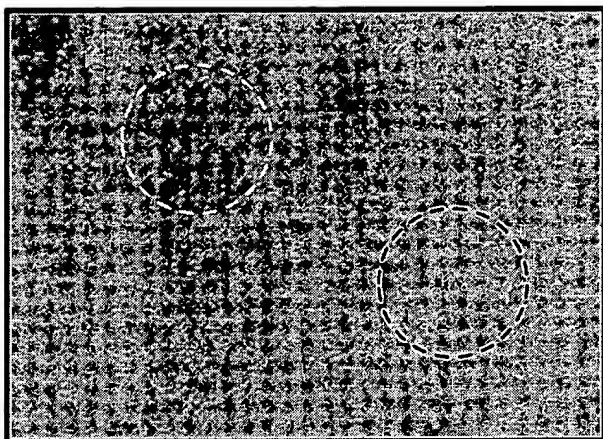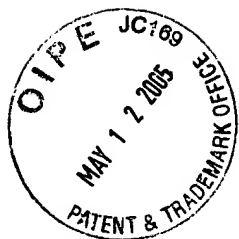
FIG. 5
(Prior Art)

FIG. 6
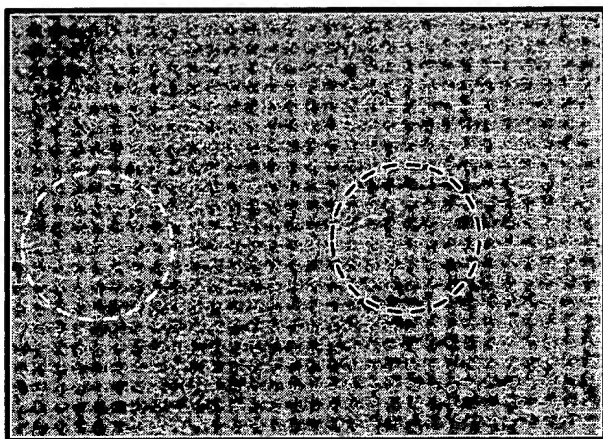
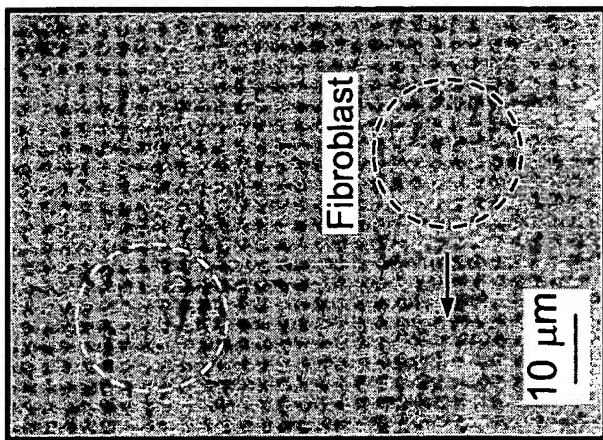FIG. 7

FIG. 8C

FIG. 8B

Reference

5 μm

FIG. 8A

FIG. 9

FIG. 10C

FIG. 10B

FIG. 10A

FIG. 11A

FIG. 11B

FIG. 12

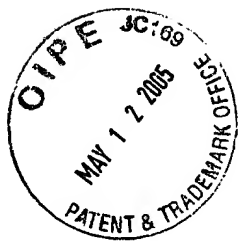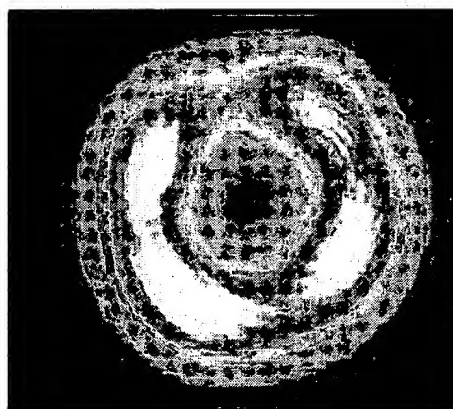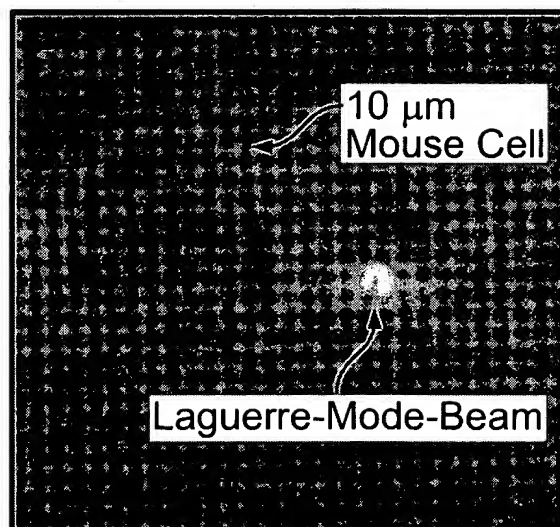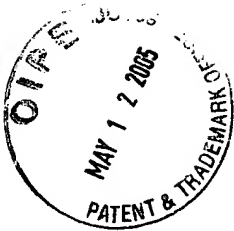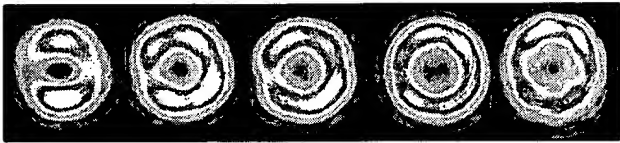## Measurement of Trapping Force on 10 μm Sphere as a Function of Driving Current

Current (mA)	Power (mW)	Power at M.O. (mW)	Speed (μm/sec)	Force (pN)	Mode
5.85	0.2	Insufficient Power to Trap			
8.5	1.58	1.33	3	0.28	
10	1.76	1.3	3.75	0.35	
14	3.52	2.68	6	0.57	
18	4.4	2.46	6.4	0.6	

FIG. 13

FIG. 14